

CLAIMS

What is claimed is:

1. A frequency-modulated laser comprising:  
a laser cavity comprising electrically-sensitive material, said laser cavity having a length dimension and a width dimension, and said laser cavity producing laser light propagating substantially parallel to the length dimension of the laser cavity; and  
means for applying a uniform electric field across said laser cavity, said electric field propagating in a direction substantially perpendicular to the direction of propagation of laser light within the laser cavity and having substantially the same intensity along the length dimension of the laser cavity at any one point in time.
2. The frequency-modulated laser of Claim 1, wherein said means for applying an electric field comprises a traveling-wave structure, said traveling wave-structure having a width equal to or greater than the length dimension of the laser cavity and having a length equal to or greater than the width dimension of the laser cavity, and said electric field propagating along the length of the traveling wave structure.
3. The frequency-modulated laser of Claim 2, wherein said traveling wave structure comprises a first electrode and a second electrode, wherein the laser cavity is disposed between the first electrode and the second electrode.
4. The frequency-modulated laser of Claim 2, wherein said traveling wave structure comprises a transmission line having a first line and a second line, wherein the laser cavity is disposed between the first line and the second line, the first line and the second line having widths greater than or equal to the length dimension of the laser cavity.

5. The frequency-modulated laser of Claim 1, wherein the laser cavity comprises a laser cavity in a laser semiconductor structure.
6. The frequency-modulated laser of Claim 1, wherein the laser cavity comprises a laser cavity in a pumped laser.
7. The frequency-modulated laser of Claim 6, wherein said laser cavity comprises doped lithium niobate.
8. The frequency-modulated laser of Claim 1, wherein said laser cavity has an index grating as a frequency-determining element, said index grating having a dielectric constant and said uniform electric field changing the dielectric constant of said index grating.
9. A method for frequency modulating a laser light signal with an electrical signal, said method comprising the steps of:  
providing a laser cavity with a length and width, the laser cavity providing a lasing condition;  
producing laser light within the laser cavity, the laser light propagating in a direction substantially parallel to the length dimension of the laser cavity;  
maintaining the lasing condition with energy applied to a gain medium within said laser cavity;  
applying the electrical signal to said laser cavity to produce an electric field uniformly and simultaneously changing the index of refraction along the length of the laser cavity in proportion to the amplitude of the electric signal; and  
transmitting the laser light out of the laser cavity to provide a frequency-modulated laser light signal.
10. The method of Claim 9, wherein said laser cavity comprises a laser cavity within a semiconductor laser structure.

11. The method of Claim 9, wherein said laser cavity comprises a laser cavity within a pumped laser.
12. The method of Claim 11, wherein the step of maintaining the lasing condition comprises applying light energy at one end of said laser cavity.
13. The method of Claim 11, wherein the laser comprises a side-pumped laser.
14. The method of Claim 11, wherein the laser cavity comprises doped lithium niobate.
15. The method of Claim 9, wherein the electrical signal is a radio frequency signal propagating within a traveling wave structure, the radio frequency signal propagating in a direction substantially perpendicular to the direction of propagation of the laser light.
16. The method of Claim 15, wherein the traveling wave structure comprises a transmission line having a first line and a second line, the laser cavity being disposed between the first line and the second line, and the first line and the second line having a width greater than or equal to the length of the laser cavity.
17. The method of Claim 9, wherein said laser cavity has an index grating as a frequency-determining element, said index grating having a dielectric constant and said electric field changing the dielectric constant of said index grating
18. A frequency-modulated laser comprising:  
a laser cavity comprising electrically-sensitive material having a changeable index of refraction, the laser cavity having longitudinally coincident gain and phase sections, wherein laser light propagates within the laser cavity in a direction substantially parallel to a length dimension of the laser cavity; and

a traveling wave structure disposed to apply a radio frequency field across the laser cavity to change the index of refraction along the length dimension of the laser cavity length substantially simultaneously and substantially uniformly, the radio frequency field propagating in the traveling wave structure in a direction substantially perpendicular to the direction of laser light propagating in the laser cavity.

19. The frequency-modulated laser of Claim 18, wherein the traveling wave structure is terminated by an external impedance device with an impedance equal to the characteristic impedance of the traveling wave structure.
20. The frequency-modulated laser of Claim 18, wherein the traveling wave structure is terminated by an open circuit.
21. The frequency-modulated laser of Claim 18, wherein the laser cavity comprises a laser cavity in a laser semiconductor structure.
22. The frequency-modulated laser of Claim 18, wherein the laser cavity comprises a laser cavity in a pumped laser.
23. The frequency-modulated laser of Claim 18, wherein said laser cavity has an index grating as a frequency-determining element, said index grating having a dielectric constant and said radio frequency field changing the dielectric constant of said index grating.

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